Evaluating CD-ROM versions of the MEDLINE database: a checklist*

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The emergence of CD-ROM (compact disc/read-only memory) versions of the MEDLINE database requires experienced MEDLINE searchers to examine assumptions about searching MEDLINE, since some expectations may not be fulfilled by this new technology. When applied to a particular CD-ROM MEDLINE product, the evaluation procedure involves testing assumptions concerning database contents; mechanics of searching; display, print, and download capabilities; and user-friendly features. The extent to which a CD-ROM product preserves and exploits important MEDLINE strengths should be assessed, e.g., the MeSH controlled vocabulary, the designation of major and minor MeSH emphasis, and the use of subheadings. Search software characteristics that affect ease of searching and quality of results also need to be examined, e.g., the ability to truncate search terms and the order of precedence in which Boolean operators are evaluated. A checklist to assist in the evaluation process is presented, including search examples for use in testing search functions.

In 1986 the National Library of Medicine (NLM) made subsets of its MEDLINE database available for production in CD-ROM format. A number of vendors have made such products available, along with user-friendly software designed to assist the novice searcher. Search and output functions differ among CD-ROM versions of MEDLINE, just as they do among online services such as NLM, BRS, and DIALOG, and an understanding of how a particular system works can aid in comparing products.

CHECKLIST BACKGROUND AND DEVELOPMENT

Background information on CD-ROM—the technology, terminology, applications, pros and cons, and trends—has been presented in numerous publications [1–2]. Selection of databases, hardware requirements and compatibility, costs, and overall issues of planning for CD-ROM implementation have also been discussed elsewhere [3–7].

In December 1987, the Washington Health Information Network released a comparison chart listing MEDLINE coverage (full database, English language subset, etc.), time span and number of discs, update frequency, and hardware and operating system requirements [8]. Search and output features were only briefly mentioned in this chart. Miller [9] and Stewart [10] have both presented lists of concerns that touch on search capabilities, and Helgerson [11] has tabulated a number of search and retrieval capabilities for the earlier releases of a dozen software packages used with CD-ROM databases. Most actual evaluation studies, however, deal with user satisfaction (such as the studies of InfoTrac critiqued by Hall [12] and Dennis' report [13] of a patron evaluation of Compact Cambridge MEDLINE, software version 1.0, at Hahnemann University Library), rather than in-depth evaluations of search software capabilities.

The development of the checklist began with an interest in reviewing and comparing all of the CD-ROM versions of MEDLINE from a quality control standpoint not taken in user satisfaction studies. It quickly became apparent that a careful and comprehensive evaluation of all of these products might take a year to accomplish, during which time new search software releases would be issued by the CD-ROM producers. Thus, the result would be an invalid and unfair comparison of the current software versions from some producers with outdated and superseded

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releases from others. This led to the decision to develop an orderly approach to the evaluation of CD-ROM products, and a format for recording the evaluator's findings, which could be used as needed by individuals involved in the selection process.

USING THE CHECKLIST

The checklist is intended to be used by experienced MEDLINE searchers. It assumes that a searcher has a working knowledge of the techniques of online searching and the MEDLINE database. Search examples are given for most checklist items that deal with search functions. Evaluators may want to attach printouts and screen prints to the checklist for later reference.

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Some CD-ROM products come with search software that provides two means of accessing the records in the database: a menu mode, intended for novice searchers, in which menus of search and output functions are displayed on the screen for the user's choice; and a command mode, for more experienced users, in which the searcher enters commands directly. Any differences in capabilities and performance should be noted for a product that provides both modes.

The "Database Content" section of the checklist prompts the evaluator to discover what is actually on the disc with regard to the time range covered and the subset, such as citations only to English language articles or those included in *Abridged Index Medicus.* Because the most basic part of any database is the individual record, the "Record Content" section reminds the evaluator to determine what fields of the record (e.g., author field, language field) are present and how they are searched.

Regardless of the content of a database, the searcher's ability to derive information depends on how the search software actually works and on the searcher's understanding of it. The checklist section on search functions covers the "online tool kit" (Boolean operators, proximity searching, truncation, etc.) with which experienced searchers and their clients are familiar, prompting the evaluator to test for the ability to combine these functions.

Particular attention should be paid to Boolean logic, especially if the product under examination does not permit "nesting." In nesting, the searcher uses parentheses to control the order in which Boolean operators are acted upon when a search statement contains several of them. This order of precedence differs among CD-ROM products just as it does among online services.

The treatment of the MeSH vocabulary used in MEDLINE indexing is included in the checklist. The user's manual and online help screens may not make this treatment clear, particularly in relation to major and minor emphasis of MeSH descriptors (i.e., whether the subject is a main point of the document), subheadings, and the entry forms for multi-word descriptors.

The searcher's ability to select certain records from particular sets, to have them sorted, and to specify the record format for output all can impact on the user's time commitment and frustration level.

CD-ROM MEDLINE products are beginning to incorporate the "explosion" function, by which a MeSH heading retrieves not only the records indexed to itself but also those indexed to descriptors more narrow in scope. When testing a product with this capability, the evaluator should explore whether it works correctly with MeSH terms spelled out, with the equivalent tree numbers, and with main heading/subheading combinations. If MeSH descriptors cannot be exploded with a particular CD-ROM product, the experienced MEDLINE searcher may want to investigate other ways to formulate the search.

Output capabilities (to screen, printer, or disk) are included in the checklist because they have important ramifications for how easily search results can be used. The searcher's ability to select certain records from particular sets, to have them sorted, and to specify the record format for output all can impact on the user's time commitment and frustration level.

The checklist concludes with a "User-Friendliness" section, which prompts the evaluator to note such online helps and timesavers as point-of-need help screens, the capability of saving a search strategy for use with a multi-disc database, and the software's ability to serve as a front end for online databases. The items in this section can be important in comparing CD-ROM products for selection purposes. Obviously, if the basic structure of the database or the search software is flawed, then no number of user-friendly features will redeem the product. However, when a CD-ROM version of a database is basically sound, its use can be enhanced by features such as appropriate menu options, intrinsically meaningful commands, and the possibilities of reversing a com-

mand, canceling lengthy processing, or exiting the system at any time.

Other use-related issues can best be evaluated by noting how novice users have gone astray, whether due to assumptions made or to quirks in search software. When combined with an orderly testing of the experienced searcher's expectations, this information can help improve CD-ROM products and assist in their use.

CONCLUSION

Readers should modify the checklist freely to suit their needs. For example, the checklist has been used as the basis for *MEDLINE on CD-ROM: Features Comparison*, a checklist prepared by Joyce E. B. Backus of NLM. The checklist was distributed to participating vendors to complete in preparation for NLM's Evaluation Forum: MEDLINE on CD-ROM held on September 23, 1988.

Although the checklist was designed as a way to organize and test what was expected of MEDLINE on CD-ROM, it could also be applied to any product or system that permits the user to search MEDLINE. With some modifications in the descriptors section, the checklist could be used for other bibliographic databases as well. The checklist is also a means of becoming completely familiar with the capabilities of a product already in place as well as providing information for the selection of CD-ROM products.

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APPENDIX

CHECKLIST FOR EVALUATION OF CD-ROM VERSION OF MEDLINE DATABASE†

PRODUCER: SOFTWARE VERSION:
DATABASE: DATE EVALUATED:
NUMBER OF DISCS AND TIME SPAN FOR EACH:
UPDATE FREQUENCY:

(Note: If menu & command modes available, note any differences.)

DATABASE CONTENT

1. Time range: Stated _____ Actual _____
   (Search REVIEW (MeSH descriptor); citations should include those from newest and oldest *Index Medicus* issues which correspond to time range.)
2. Subset: Stated _____ Actual _____
   (Search update codes corresponding to time range; compare number of records to online search of same codes limited to subset, e.g., *Abridged Index Medicus* (AIM) journals.)

RECORD CONTENT (Indicate searchable/printable)

3. NLM record elements:
   ___ / ___ Author (e.g., LEVY SB)
   ___ / ___ Title (IBUPROFEN)
   ___ / ___ Abstract (IBUPROFEN)
   ___ / ___ Descriptor (IBUPROFEN)
   ___ / ___ Language (ENGLISH)
   ___ / ___ Publication year (1987)
   ___ / ___ Journal (N ENGL J MED)
   ___ / ___ Special list (AIM)
   ___ / ___ Accession #
   ___ / ___ Update code
   ___ / ___ Author address (BOSTON)
   ___ / ___ English abstract
   ___ / ___ Registry # (15687-27-1)
   ___ / ___ Substance name (OLIVE OIL)
   ___ / ___ ISSN (0028-4793)
   ___ / ___ Country of publication (JAPAN)
4. Record elements added by CD-ROM producer:
   ___ / ___

SEARCH FUNCTIONS

5. Unqualified term is searched in all fields: ___ Yes ___ No

† To receive a copy of the checklist as a WordStar file, send a blank 5¼" diskette and return postage to the author.

6. Field searching (IBUPROFEN in title, abstract, descriptor):
   ___ Qualification to specific field possible
   ___ Qualification to more than one field at a time
   ___ Post qualification (SS1/TITLE)
7. Boolean logic: ___ AND ___ OR ___ NOT/ANDNOT
8. Order of precedence for evaluating operators:
   ___ AND, NOT, OR ___ NOT, AND, OR ___ Left to right
   ___ Other:
   User can control by nesting ___ Yes ___ No
9. Proximity searching ("HOME NURSING," "NURSING HOME"):
   ___ Same field, any order
   ___ Same sentence, any order
   ___ Same sentence, any order, immediately adjacent
   ___ Same sentence, any order, within N words
   ___ Same sentence, same order, immediately adjacent
   ___ Same sentence, same order, within N words
10. Truncation/wild card: ___ Right (SCHIZOPHRENIA*)
    ___ Left (*EWITT in author) ___ Within word (TUMO*R, WOM*N)
    Symbol(s) used:
11. Stopwords: ___ Operational (AND, OR, IN) ___ List provided
12. Search helps and timesavers:
    ___ Display database index (NBR, ROOT, EXPAND)
    ___ Display particular index (e.g., descriptors)
    ___ Select index terms to be searched without rekeying
    ___ Display search history
    ___ Erase prior search statements
    ___ Back-reference sets (e.g., SS1 AND SS9)
    ___ Limiting possible (e.g., by year, language)
13. Ability to combine search capabilities:
    ___ Truncation & proximity (NURSING adjacent to HOME*)
    ___ Truncation & field qualification (SCHIZOPHRENIA* in title)
    ___ Truncation & nested logic, e.g., (OCCUPATION* OR INDUSTR*) AND ACCIDENT*
    ___ Nested logic & field qualification, e.g., (RETROVIRUS OR RETROVIRIDAE) in title
    ___ Proximity & field qualification, e.g., NURSING adjacent to HOME in title

MeSH DESCRIPTORS

14. ___ Displayable ___ Printable ___ Downloadable
15. MeSH words searched in an unqualified search:
    ___ Yes ___ No
16. Single-word descriptors protected:
    ___ Yes ___ No
17. Multi-word descriptors:
    ___ Bound for precision (NURSING ASSESSMENT)
    ___ Stopwords/commands (WOUNDS AND INJURIES)
    ___ Commas (NEOPLASMS, EXPERIMENTAL)
    ___ Hyphens (FATHER-CHILD RELATIONS)
    ___ Apostrophes (SJOGREN'S SYNDROME)
18. Major/minor emphasis: ___ Indicated in records
    ___ Searchable
    ___ Can search both at once
    ___ Can restrict to major ___ Can restrict to minor
    ___ Major descriptors are posted to minor descriptors
19. Subheading searching (PARROTS—AH, CL, HI):
    ___ Main heading with no subheadings
    ___ Main heading with one specific subheading
    ___ Main heading with several, specified subheadings
    ___ Main heading with all possible subheadings
    ___ Main heading with all possible subheadings plus with none
    ___ "Naked" subheading (e.g., AH or ANATOMY AND HISTOLOGY)
20. Consistency in searching:
    ___ Major/minor emphasis searched identically for single-word and multi-word MeSH headings (e.g., DOPING IN SPORTS)
    ___ Main heading/subheading combination searched identically for single-word and multi-word MeSH headings (e.g., DOPING IN SPORTS—LJ, MT, PC)
    ___ Major and minor headings searched identically (except for emphasis)
    ___ Major heading/subheading and minor heading/subheading searched identically (except for emphasis)
21. Explosions: ___ Single-word term ___ Multi-word term ___ Tree number ___ Subheadings
22. Check tags (e.g., HUMAN) given special treatment? ___ Yes ___ No
23. Review articles searchable? ___ Yes ___ No

OUTPUT CAPABILITIES

24. Formats (indicate yes/no for each output mode):

Various formats available:	___ Display	___ Print	___ Download
User can tailor format:	___ Display	___ Print	___ Download
Titles only:	___ Display	___ Print	___ Download
Bibliographic citation:	___ Display	___ Print	___ Download
Bib. cit. and abstract:	___ Display	___ Print	___ Download
Full record:	___ Display	___ Print	___ Download
Title and descriptors:	___ Display	___ Print	___ Download

    Other(s):
25. Selection of sets, records (indicate yes/no for each output mode):

User can specify set:	___ Display	___ Print	___ Download
User can specify records:	___ Display	___ Print	___ Download
Can specify field labels:	___ Display	___ Print	___ Download
Abbreviated:	___ Display	___ Print	___ Download
Written out:	___ Display	___ Print	___ Download
Omitted:	___ Display	___ Print	___ Download

26. Record order (indicate yes/no for each output mode):

Last-in-first-out:	___ Display	___ Print	___ Download
Other:			
User can specify sort:	___ Display	___ Print	___ Download

27. Downloaded output compatible with word processing software? ___ Yes ___ No

USER-FRIENDLINESS

28. Modes available: Novice: ___ Menu ___ Command
    Experienced: ___ Menu ___ Command
29. Menus (attach screen prints showing menus):
    ___ Contain appropriate choices
    ___ Expressed meaningfully
    ___ Ways to undo/escape from/reverse menu choices
    ___ "Quit" always available
30. Commands (list commands or attach screen prints):
    ___ Easy to remember/intrinsically meaningful
    ___ Ways to undo/escape from/reverse commands
    ___ Abbreviated forms ___ "Quit" always available
    ___ Forgiveness re command entry format, e.g., spaces
31. Processing:
    ___ Message displays on screen to show processing in operation
    ___ User can interrupt processing
32. Time- and keystroke-saving features:
    ___ Function keys used
    ___ Can save search strategy for use with multi-disc database
    ___ Other(s):
33. Online help:
    ___ Instructional/tutorial screens
    ___ Contextual/point-of-need screens ___ Helpful
    ___ If multiple screens per topic, table of contents and jump
    ___ Error messages understandable and enabling
34. Documentation:
    ___ Clearly written and understandable
    ___ Logically arranged
    ___ Well indexed
    ___ Important search features explained
    ___ Basic introduction to special features of database
35. Telephone user support:
    ___ Toll-free hotline ___ Staff knowledgeable
    ___ Staff follows up if answer not immediately known
36. Use-related issues:
    ___ Can be used with little or no training
    ___ Can be used without reading manual
    ___ End users require minimal library staff involvement
    ___ Defaults appropriate for end users
    ___ Nonstandard entry formats yield surprises (comment)
37. Special features:
    ___ Highlighting terms searched:
    ___ On screen
    ___ On printout
    ___ Serves as front end to online vendor(s)
    ___ Other(s):